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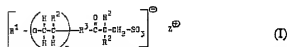
(54) β -SULFO-PROPIONIC ACID COMPOUNDS AND
 THEIR MANUFACTURE

(71) We, BASF AKTIENGESSELLSCHAFT, a German Joint Stock Company of 6700 Ludwigshafen, Federal Republic of Germany, do hereby declare the invention, for which we pray that a Patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following Statement:—

The invention relates to new β -sulfo-propionic acid compounds and a process for their manufacture by reaction of alcohols, acid amides or amines with β -sulfo-carboxylic acid anhydrides.

The reaction of β -sulfo-propionic anhydride with methanol, ammonia or amines to give the corresponding ester or amide, respectively, is disclosed in J. Amer. Chem. Soc., 62 (1940), 2,395—2,397.

According to the present invention there are provided β -sulfo-propionic acid compounds of the formula



where R^1 is a straight-chain aliphatic radical of at least 4 carbon atoms, an araliphatic radical (linked through the aliphatic or aromatic moiety) or 2-ethyl-hexyl, the individual R^2 's are identical or different and each is hydrogen or an aliphatic radical, R^3 is oxygen or



R^4 being hydrogen or an aliphatic radical, Z is a hydrogen ion,



an alkali metal ion or



the individual R^2 's being identical or different and each being an aliphatic radical or hydrogen, n is 0 or an integer from 1 to 100, and if n is 0, R^1 and R^2 may also together be



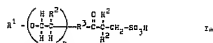
R^4 being hydroxyethyl or hydrogen and R^1 having the above meaning, provided that if n is 7 or 12 and R^3 is oxygen, Z is



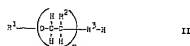
or NH_4^+ ,

that if R^1 is hexadecyl, n is an integer and R^2 is oxygen, Z is a hydrogen ion, an alkali metal ion or NH_4^+ , that if R^1 is hexadecyl, n is 0 and R^3 is oxygen, Z is a hydrogen ion or NH_4^+ , and that if R^1 is straight chain aliphatic and n is 0, R^3 is oxygen.

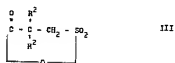
The invention also provides a process for the manufacture of a β -sulfo-propionic acid of the formula



where R^1 , R^2 , R^3 and n have the above meanings, which comprises reacting an alcohol, acid amide or amine of the formula



where R^1 , R^2 , R^3 and n have the above meanings with a β -sulfo-carboxylic acid anhydride of the formula

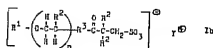


where R^2 has the above meaning.

The resulting β -sulfo-propionic acid Ia may be reacted with an alkali, morpholine or a base of the formula



where R^5 has the above meaning, to give a β -sulfo-propionic acid compound of the formula



where R^1 , R^2 , R^3 and n have the above meanings and Y is

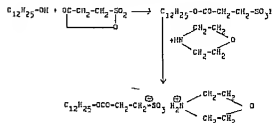


an alkali metal ion or



the individual R^1 's being identical or different and each being an aliphatic radical or hydrogen.

Where sulfo-propionic anhydride, dodecyl alcohol and morpholine are used, the reaction may be represented by the following equation:



The process of the invention gives a large number of new β -sulfo-propionic compounds, in the form of esters, monoacylamides and diacylamides, simply and economically and in good yield and purity.

The starting materials II and III can be reacted in stoichiometric amounts or in excess (of one material), preferably in a ratio of from 0.5 to 2.5 moles of starting material II per mole of starting material III. Preferred compounds I, Ia and Ib are those where R¹ is straight-chain alkyl of 4 to 26, advantageously of 8 to 24, and especially of 12 to 24, carbon atoms, straight-chain alkenyl of 4 to 26, especially of 8 to 24, carbon atoms, straight-chain alkylcarbonyl of 4 to 26, advantageously 8 to 24, and especially of 12 to 24, carbon atoms, aralkyl or alkaryl of 7 to 26, advantageously of 10 to 24 and especially of 10 to 18, carbon atoms, preferably nonylphenyl, isooctylphenyl or octylphenyl, or 2-ethylhexyl, the individual R²'s are identical or different and each is hydrogen or alkyl of 1 to 4 carbon atoms, R³ is oxygen or



R⁴ being hydrogen, alkyl or 1 to 4 carbon atoms or hydroxyethyl, Z is a hydrogen ion,



a sodium or potassium ion or



the individual R²'s being identical or different and each being alkyl of 1 to 26, advantageously of 8 to 24, and especially of 12 to 24, carbon atoms, hydroxyethyl or hydrogen, n is 0 or an integer from 2 to 80, and if n is 0 R¹ and R² may also together be



where R⁶ is hydroxyethyl or hydrogen and R³ has the above meaning, provided that if n is 7 or 12 and R³ is oxygen, Z is



or NH₄⁺,

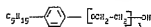
that if R¹ is hexadecyl, n is an integer and R² is oxygen, Z is a hydrogen ion, a sodium or potassium ion or NH₄⁺, that if R¹ is hexadecyl, n is 0 and R³ is oxygen, Z is a hydrogen ion or NH₄⁺, and that if R¹ is straight chain alkyl, alkenyl or alkylcarbonyl and n is 0, R³ is oxygen.

The above radicals can further be substituted by groups and/or atoms which are inert under the reaction conditions, e.g. carboxylic acid amide, cyano, nitro, chlorine, bromine, carbalkoxy or acylamido each of 2 to 4 carbon atoms, or alkyl or alkoxy each of 1 to 4 carbon atoms.

The preferred end products may be prepared from corresponding preferred starting compounds II, III and IV.

It is possible, and advantageous, to react mixtures of straight-chain alcohols, e.g. those obtained from the oxo synthesis, and further process the resulting mixtures of products I directly, e.g. to give surfactants. This is economically advantageous because it saves isolating the individual alcohols from the mixtures, which in most cases is a laborious operation entailing heavy losses. A further range of very valuable alcohols for the reaction with the sulfo-carboxylic acid anhydride is obtained by oxyalkylation of straight-chain alcohols with epoxides, e.g. ethylene oxide and/or propylene oxide, which are reacted with the alcohols in the ratio of from 1 to 100 moles of alkylene oxide or a mixture of the epoxides per mole of alcohol. If mixtures of amines, e.g. fatty amines such as laurylamine, are used as starting materials, mixtures of the sulfonates of these amines with the corresponding β -sulfo-propionic acid amides are obtained.

Examples of suitable starting materials II are n-butyl alcohol, 2-ethylhexanol, n-octanol, decanol, dodecanol, tetradecyl alcohol, octadecyl alcohol, stearic acid ethanolamide, the glycol half-ester of lauric acid, octylphenol, nonylphenol and dodecylphenol; butylamine, decylamine, dodecylamine, octadecylamine, dibutylamine, methylbutylamine, methylbenzylamine, methyltetradecylamine and N-hydroxyethyl-N-butylamine; n-nonanol, n-undecanol, tridecanol, pentadecanol, hexadecanol, heptadecanol, n-tetradecanol, octadecyl alcohol, 2-undecyl-5-hydroxyethyl-imidazoline, n-nonylamine, oleylamine, 2-ethylhexylamine, hexacosanol and lauric acid ethanolamide; the above alcohols oxyalkylated with 2, 3, 4, 5, 25, 80 or 100 moles of ethylene oxide or propylene oxide or moles of ethylene oxide and propylene oxide (in the ratio of from 0.1 to 20 moles of propylene oxide per mole of ethylene oxide), e.g. nonylphenyl-tris-oxyethyl alcohol



and appropriate mixtures

Possible starting materials III are β -sulfo-propionic anhydride, β -sulfo-pivalic anhydride and the anhydride of 2-ethylhexanoic acid-2-carboxylic acid.

The reaction is as a rule carried out at from 0 to 120°C., preferably from 20 to 90°C., under atmospheric or superatmospheric pressure, continuously or batchwise. Preferably, no solvent is used. However it is also possible to use organic solvents which are inert under the reaction conditions, such as chlorohydrocarbons, e.g. ethylene chloride and chloroform, cyclic ethers, e.g. dioxane and tetrahydrofuran, and aliphatic or aromatic hydrocarbons, e.g. toluene, heptane and petroleum ether.

The reaction may, e.g., be carried out as follows: the appropriate starting material II is added to the sulfo-carboxylic acid anhydride III, optionally in a solvent, whilst stirring well. The mixture is then kept for a further 2 to 3 hours at the reaction temperature. The product is isolated by conventional methods, e.g. by distillation. It is, however, more advantageous to neutralize the sulfonic acid Ia which has been formed with bases IV, alkali or morpholine and to isolate the product Ib by conventional methods, e.g. by crystallization from suitable solvents such as alkanols, e.g. ethanol and isobutanol, halo-hydrocarbons, e.g. ethylene chloride and chloroform, tetrahydrofuran, acetone, ethyl acetate and diethyl ether. Where amines II are used, neutralization is conveniently effected by using an appropriate excess of amine II. In general, the neutralization is effected at from 0 to 80°C., under atmospheric or superatmospheric pressure, continuously or batchwise, over the course of from 0.1 to 12 hours, using from 1 to 4, preferably from 1.6 to 3, equivalents of base per mole of product Ia. Preferred bases are sodium and potassium compounds, especially sodium hydroxide and potassium hydroxide, morpholine, ammonia, primary, secondary or tertiary alkylamines of 1 to 26, advantageously of 1 to 4 or 8 to 24, carbon atoms per alkyl group, e.g. dimethylamine, methylamine, trimethylamine, triethylamine, diethylamine, monoethylamine, propylamine, dipropylamine, tripropylamine, dibutylamine, butylamine, tributylamine, nonylamine, dinonylamine, trinonylamine, tetraoctylamine, isopropylamine, diisopropylamine, triisopropylamine, stearylamine, distearylamine and tristearylamine, and amines containing hydroxyethyl groups, e.g. ethanolamine, diethanolamine, triethanolamine, butyldiethanolamine and dimethylethanolamine. After neutralization, the salt is isolated by conventional methods, e.g. by filtration.

The new products I which can be manufactured by the process of the invention are textile assistants, e.g. washing, cleansing or wetting agents, dishwashing detergents, hair shampoos, emulsifiers, flotation agents, plasticizers and valuable starting materials for the manufacture of such assistants, as well as for the manufacture of dyes and pesticides. Thus, with all products of the examples which follow, e.g. with a mixture of sodium (dodecyl-dioxyethyl propionate)- β -sulfonate and sodium (tetra-decyl-dioxyethyl propionate)- β -sulfonate (in the ratio of 1:1), a very good wetting effect on cellulosic material and a very good detergent action when laundering cotton fabrics and

washing woollen articles, impregnated with olive oil or mineral oil, is achieved at concentrations of only from 10 to 100 parts per 1,000 parts of water. Furthermore, all the products of the examples which follows, e.g. the mixture of sodium (dodecyl-tris-oxyethyl propionate)- β -sulfonate and sodium (octadecyl-tris-oxyethyl propionate)- β -sulfonate (in the ratio of 1:1) can be used in dishwashing detergents of moderate foaming power, having, e.g., the following composition:

5 parts of diethanol ammonium alkylbenzenesulfonate
 5 parts of nonylphenol condensed with 10 moles of ethylene oxide
 5 parts of sodium (dodecyl/octadecyl-tris-oxyethyl propionate)- β -sulfonate (1:1)
 5 parts of isopropanol
 5 parts of tetrapotassium pyrophosphate
 75 parts of water

In the Examples which follow, parts are by weight.

EXAMPLE 1

29.6 parts of n-butanol are added to a melt of 54.5 parts of β -sulfolpropionic anhydride at 65°C, whilst stirring. After stirring for a further two hours at 70°C, the sulfonic acid 1 which is formed is neutralized by adding 51.7 parts of butyldiethanolamine, 122 parts (83.8% of theory) of butyldiethanolammonium (butyl propionate)- β -sulfonate are obtained as a brown oil. $n_D^{25}=1.4712$.

EXAMPLE 2

130 parts of 2-ethylhexanol are added slowly to a melt of 163 parts of β -sulfolpropionic anhydride at 75°C. After stirring for a further three hours at 80°C, the mixture is adjusted to pH 5 with 90 parts of 50 per cent strength by weight sodium hydroxide solution at 50°C, whilst stirring. Sodium (2-ethylhexyl propionate)- β -sulfonate is obtained in the form of a 64 per cent strength by weight paste which is readily water-soluble. Yield: 265 parts (90.5% of theory). $n_D^{25}=1.4589$.

EXAMPLE 3

(a) 130 parts of dodecyl alcohol are added slowly to a melt of 95 parts of β -sulfolpropionic anhydride at from 75 to 80°C, whilst stirring and slightly cooling the mixture. After stirring for a further three hours at 85°C, 225 parts of (dodecyl propionate)- β -sulfonic acid of melting point 36—38°C (after recrystallization from ethylene chloride) are obtained.

(b) 28.6 parts of morpholine are added to 96.8 parts of the sulfonic acid I at 40°C, whilst stirring. The mixture is diluted with 100 parts of ethylene chloride and stirred for 2 hours at 60°C. After adding 800 parts of petroleum ether, the morpholinium (dodecyl-propionate)- β -sulfonate which has crystallized out is filtered off and recrystallized from ethanol. Melting point 74—77°C; yield: 100 parts (81.5% of theory).

EXAMPLE 4

65.5 parts of β -sulfolpivalic anhydride are introduced into 74.5 parts of dodecyl alcohol at 25°C, whilst stirring. When the exothermic reaction has ended, the mixture is slowly warmed to 70°C and stirred at this temperature for 3 hours. The (dodecyl pivalate)- β -sulfonic acid is obtained in the form of a yellow oil of $n_D^{25}=1.4563$.

37 parts of morpholine are added slowly to the product I. After dilution with 250 parts of petroleum ether, the mixture is stirred for one hour. The suspension obtained is cooled and the product is then filtered off and recrystallized from acetone. Melting point 70.5—72°C; yield 146 parts (74.2% of theory) of morpholinium (dodecyl pivalate)- β -sulfonate.

EXAMPLE 5

48.5 parts of a mixture of straight-chain alcohols, containing 27.5% by weight of nonyl alcohol, 12% by weight of decyl alcohol and 60.5% of undecyl alcohol are added to a melt of 41 parts of β -sulfolpropionic anhydride at 65°C, whilst stirring. After stirring for a further three hours at 70°C, the mixture is cooled and neutralized with 48 parts of 25 per cent strength by weight sodium hydroxide solution at 30°C. A water-soluble paste containing 137 parts (100% of theory) of sodium (nonyl, decyl and undecyl propionate)- β -sulfonate of melting point 280—285°C (with decomposition) (after recrystallization from acetone) is obtained. The ratio of the esters corresponds to the ratio of the alcohols used.

EXAMPLE 6

64 parts of a mixture of straight-chain alcohols containing 28.5% by weight of dodecanol, 27% by weight of tridecanol, 23% by weight of tetradecanol and 21.5% by weight of pentadecanol are added to a melt of 41 parts of sulfolpropionic anhydride at from 70 to 80°C. After stirring for a further three hours at 70°C, the sulfonic acid I, which is in the form of a dark brown oil, is neutralized by adding 26.5 parts of 50 per cent strength by weight sodium hydroxide solution. 130 parts (100% of theory) of sodium (tridecyl, dodecyl, tetradecyl and pentadecyl propionate)- β -sulfonate of $n_D^{20}=1.4613$ are obtained. The ratio of the esters corresponds to the ratio of the alcohols used.

EXAMPLE 7

78 parts of a mixture of n-hexadecyl alcohol and n-octadecyl alcohol (2:1) are added to a melt of 41 parts of β -sulfolpropionic anhydride, whilst stirring. After stirring for a further three hours at 75°C, the brown melt is taken up in 350 parts of ethylene chloride and 29 parts of morpholine are added whilst stirring at from 50 to 70°C. The ethylene chloride is distilled off under reduced pressure and the residue is recrystallized from ethanol. 142 parts (96% of theory) of morpholinium (hexadecyl/octadecyl propionate)- β -sulfonate are obtained in the form of light brown crystals. Melting point 76–80°C. The ratio of the esters corresponds to the ratio of the alcohols used.

EXAMPLE 8

68.5 parts of a fatty alcohol mixture containing 41% by weight of dodecanol, 30% by weight of tetradecanol, 18% by weight of hexadecanol and 11% by weight of octadecanol are added to a melt of 41 parts of sulfolpropionic anhydride at from 60 to 70°C, whilst stirring. After stirring for a further three hours, the sulfonic acid I is obtained as a brown oil which is neutralized by adding 26.4 parts of 50 percent strength by weight sodium hydroxide solution at 30°C. Precipitation with acetone gives 93 parts of sodium (dodecyl, tetradecyl, hexadecyl and octadecyl/propionate)- β -sulfonate as white crystals which give a clear solution in water. Melting point 300°C (with decomposition). The ratio of the esters corresponds to the ratio of the alcohols used.

EXAMPLE 9

99.5 parts of a mixture of n-dodecyl alcohol and n-tetradecyl alcohol (55.5:45.5) oxyethylated with 3 moles of ethylene oxide are added to a melt of 41 parts of β -sulfo-propionic anhydride at from 50 to 70°C, whilst stirring. After stirring for a further three hours at 70°C, 28.6 parts of morpholine are added to the mixture at from 40 to 70°C and the batch is stirred for a further 3 hours. 159 parts (94% of theory) of morpholinium (dodecyl/tetradecyl-tris-oxyethyl propionate)- β -sulfonate are obtained as a light brown paste. $n_D^{20}=1.4598$. The ratio of the esters corresponds to the ratio of the alcohols used.

EXAMPLE 10

65.5 parts of β -sulfolpivalic anhydride are introduced into 133 parts of a mixture of n-dodecyl- and n-tetradecyl-tris-oxyethyl alcohol (55:45) at from 60 to 70°C. 198 parts (a practically quantitative yield) of the sulfonic acid I are obtained as a red-brown oil of $n_D^{20}=1.4613$.

The mixture is neutralized by adding 39.5 parts of 50 per cent strength by weight sodium hydroxide solution. 237 parts (a practically quantitative yield) of sodium (dodecyl/tetradecyl-tris-oxyethyl pivalate)- β -sulfonate are obtained as a 91.6 per cent strength aqueous solution. The ratio of the esters corresponds to the ratio of the alcohols used.

EXAMPLE 11

9.5 parts of sulfolpropionic anhydride are added to 227 parts of a mixture of straight-chain alcohols, containing 65% by weight of hexadecanol and 35% by weight of octadecanol, which has been oxyethylated with 80 moles of ethylene oxide. After stirring for a further three hours at from 75 to 80°C, the (propionic acid ester)-sulfonic acids I are obtained as a brown oil ($n_D^{20}=1.4617$). This is neutralized by adding 236 parts of water and 10 parts of 50 per cent strength by weight sodium hydroxide solution at from 30 to 40°C. 482 parts of the sodium (propionic acid ester)- β -sulfonate based on the above alcohol mixture are obtained as an aqueous paste. The ratio of the esters corresponds to the ratio of the alcohols used.

EXAMPLE 12

378 parts of n-nonanol which has been oxyalkylated with 3 moles of ethylene oxide and 2 moles of propylene oxide are added to a melt of 129 parts of β -sulfo-

propionic anhydride at from 70 to 80°C, whilst stirring. After stirring for a further two hours at 80°C, 508 parts (a practically quantitative yield) of (nonyl trisoxethyl dioxypopyl propionate)-β-sulfonic acid are obtained as a brown oil ($n_D^{20}=1.4590$). The product is neutralized by adding 57 parts of 50 per cent strength by weight sodium hydroxide solution and 250 parts of water, 815 parts (a practically quantitative yield) of the sodium salt are obtained in the form of a 66 per cent strength aqueous solution.

EXAMPLE 13

106 parts of n-tetracosanol are added to a melt of 41 parts of β-sulfolpropionic anhydride at from 60 to 70°C, whilst stirring. After stirring for a further four hours at 70°C, 147 parts (a practically quantitative yield) of (tetracosyl propionate)-β-sulfonic acid are obtained as a brown oil ($n_D^{20}=1.4537$). After dilution with 260 parts of water, the mixture is neutralized with 24 parts of 50 per cent strength by weight sodium hydroxide solution. 430 parts (a practically quantitative yield) of the sodium salt are obtained in the form of a 35 per cent strength aqueous oil.

EXAMPLE 14

78 parts of n-octadecenyl alcohol are added to 41 parts of sulfolpropionic anhydride at 60°C, whilst stirring. After stirring for a further three hours at 70°C, 119 parts (a practically quantitative yield) of (octadecenyl propionate)-β-sulfonic acid are obtained as a brown oil ($n_D^{20}=1.4550$). 45 parts of triethanolamine are added at 70°C. The mixture is stirred for a further 2 hours at 70°C, 163 parts (a practically quantitative yield) of pasty triethanolamine salt are obtained.

EXAMPLE 15

118.5 parts of nonylphenol which has been oxyalkylated with 4 moles of ethylene oxide are added to 41 parts of β-sulfolpropionic anhydride at 70°C, whilst stirring. After stirring for a further two hours at 75°C, 42.8 parts of dibutylamine are added at from 40 to 60°C and the mixture is stirred for a further 2 hours at 70°C. 192 parts (97% of theory) of dibutylammonium (nonylphenyl-tetraoxyethyl propionate)-β-sulfonate are obtained as a brown oil ($n_D^{20}=1.4904$).

EXAMPLE 16

13.6 parts of β-sulfolpropionic anhydride are added at 70°C, whilst stirring, to 130.6 parts of isooctylphenol which has been oxyalkylated with 25 moles of ethylene oxide. After 3 hours at 70°C, 144.2 parts (a practically quantitative yield) of product I ($n_D^{20}=1.4847$) are obtained. After adding 270 parts of water, 12 parts of 50 per cent strength by weight sodium hydroxide solution are introduced and the mixture is stirred for 2 hours at 40°C, 426 parts (a practically quantitative yield) of sodium (isooctylphenyl propionate)-β-sulfonate are obtained as a light brown 35 per cent strength aqueous oil.

EXAMPLE 17

134 parts of 2-undecyl-5-hydroxyethyl-imidazoline are added to 68 parts of β-sulfolpropionic anhydride at 80°C. The mixture is stirred for a further 4 hours at 80°C, giving 198 parts (98% of theory) of 1-(3'-sulfolpropionyl)-2-undecyl-5-hydroxyethyl-imidazoline.

EXAMPLE 18

54.5 parts of sulfolpropionic anhydride are added to a solution of 120 parts of n-nonylamine in 250 parts of ethylene chloride at 40°C, whilst stirring. After stirring for a further two hours at 45°C, the suspension is filtered and the crystalline product is recrystallized from ethylene chloride. 86 parts (71.4% of theory) of nonylammonium (propionyl-nonylamide)-β-sulfonate are obtained as colorless crystals of melting point 167–169°C.

EXAMPLE 19

41 parts of sulfolpropionic anhydride are added to a solution of 160 parts of oleylamine in 200 parts of ethylene chloride at from 50 to 60°C. After one hour, 25 parts of 50 per cent strength by weight sodium hydroxide solution are added to the red-brown oil obtained, and the mixture is stirred for one hour at 80°C. After cooling, the suspension is filtered and the residue is heated with acetone at 56°C for half an hour. 167 parts (65.5% of theory) of sodium (propionyl-oleylamide)-β-sulfonate of melting point 304–309°C are obtained.

EXAMPLE 20

144 parts of di-(2-ethylhexyl)-amine are added to 41 parts of sulfolpropionic anhydride at 70–80°C, whilst stirring. After stirring for a further two hours at 130°C,

176 parts (70% of theory) of di-(2-ethylhexyl)-ammonium (propionyl-di-(2-ethyl-hexyl)-amide)- β -sulfonate are obtained as a brown oil of $n_D^{20} = 1.4724$.

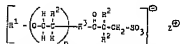
EXAMPLE 21

243 parts of lauric acid ethanolamide are added to 136 parts of β -sulfo-*propionic* anhydride at from 70 to 80°C, whilst stirring. After stirring for a further three hours at 80°C, 379 parts (practically the quantitative yield) of (propionyl-lauroylethanol-amide)- β -sulfonic acid of $n_D^{20} = 1.4719$ are obtained.

After dilution with 250 parts of water, the mixture is neutralized with 120 parts of 50 per cent strength by weight sodium hydroxide solution. 743 parts (a practically quantitative yield) of the sodium salt are obtained in the form of a 55 per cent strength white paste.

WHAT WE CLAIM IS:—

1. β -Sulfo-*propionic* acid compounds of the formula



where R^1 is a straight-chain aliphatic radical of at least 4 carbon atoms, an araliphatic radical (linked through the aliphatic or aromatic moiety) or 2-ethyl-hexyl, and individual R^2 's are identical or different and each is hydrogen or an aliphatic radical, R^3 is oxygen or



R^4 being hydrogen or an aliphatic radical, Z is a hydrogen ion,



an alkali metal ion or



the individual R^1 's being identical or different and each being an aliphatic radical or hydrogen, n is 0 or an integer from 1 to 100, and if n is 0, R^1 and R^3 may also together be



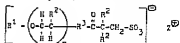
R^5 being hydroxyethyl or hydrogen and R^3 having the meanings given above, provided that if n is 7 or 12 and R^2 is oxygen, Z is



or NH_4^+ ,

that if R^1 is hexadecyl, n is an integer and R^3 is oxygen, Z is a hydrogen ion, an alkali metal ion or NH_4^+ , that if R^1 is hexadecyl, n is 0 and R^3 is oxygen, Z is a hydrogen ion or NH_4^+ , and that if R^1 is straight chain aliphatic and n is 0, R^2 is oxygen.

2. β -Sulfo-*propionic* acid compounds of the formula



where R^1 is straight-chain alkyl of 4 to 26 carbon atoms, straight-chain alkenyl of 4 to

26 carbon atoms, straight-chain alkylcarbonyl of 4 to 26 carbon atoms, aralkyl or alkaryl of 7 to 26 carbon atoms or 2-ethylhexyl, the individual R²'s are identical or different and each is hydrogen or alkyl of 1 to 4 carbon atoms, R³ is oxygen or



- 5 R⁴ being hydrogen, alkyl of 1 to 4 carbon atoms or hydroxyethyl, Z is a hydrogen ion, 5



a sodium or potassium ion or



- 10 the individual R⁵'s being identical or different and each being alkyl of 1 to 26 carbon atoms, hydroxyethyl or hydrogen, n is 0 or an integer from 2 to 80 and if n is 0, R¹ and R² may also together be 10



- 15 R⁴ being hydroxyethyl or hydrogen and R⁵ having the meanings given above, and the above radicals being optionally further substituted by one or more substituents selected from carboxylic acid amide, cyano, nitro, chlorine, bromine, carbalkoxy and acylamido each of 2 to 4 carbon atoms and alkyl or alkoxy each of 1 to 4 carbon atoms, provided that if n is 7 or 12 and R³ is oxygen, Z is 15

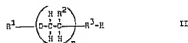


- 20 or NH₄⁺, that if R¹ is hexadecyl, n is an integer and R³ is oxygen, Z is a hydrogen ion, a sodium or potassium ion or NH₄⁺, that if R¹ is hexadecyl, n is 0 and R³ is oxygen, Z is a hydrogen ion or NH₄⁺, and that if R¹ is straight chain alkyl, alkenyl or alkylcarbonyl and n is 0, R² is oxygen. 20

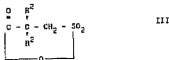
3. A process for the manufacture of a β -sulfo-propionic acid of the formula

- 25
$$\text{R}^1 - \left(\begin{array}{c} \text{H} \quad \text{R}^2 \\ | \quad | \\ \text{O} - \text{C} - \text{C} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \right)_n - \text{R}^3 - \text{S}(=\text{O})_2 - \text{CH}_2 - \text{CO}_2\text{H} \quad \text{Ia} \quad 25$$

where R¹, R², R³ and n have the meanings given in claim 1, which comprises reacting an alcohol, acid amide or amine of the formula



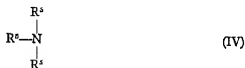
- 30 where R¹, R², R³ and n have the meanings given in claim 1, with a β -sulfo-carboxylic acid anhydride of the formula 30



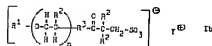
where R² has the above meanings.

4. A process as claimed in claim 3, followed by the reaction of the resulting

β -sulfo-propionic acid Ia with a base selected from alkalis, morpholine and bases of the formula



where R^2 has the meanings given in claim 1, to give a β -sulfo-propionic acid compound of the formula



in which R^1 , R^2 , R^3 and n have the meanings given in claim 1 and Y is



an alkali metal ion or



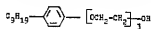
the individual R^3 's being identical or different and each being an aliphatic radical or hydrogen.

5. A process as claimed in claim 3 or 4, wherein the reaction between starting materials II and III is carried out using from 0.5 to 2.5 moles of starting material II per mole of starting material III.

6. A process as claimed in any of claims 3 to 5, wherein the reaction between starting materials II and III is carried out at from 0 to 120°C.

7. A process as claimed in any of claims 3 to 5, wherein the reaction between starting materials II and III is carried out at from 20 to 90°C.

8. A process as claimed in any of claims 3 to 7, wherein the reaction is carried out with *n*-butyl alcohol, 2-ethyl-hexanol, *n*-octanol, decanol, dodecanol, tetradecyl alcohol, octadecyl alcohol, stearic acid ethanolamide, the glycol half-ester of lauric acid, octylphenol, nonylphenol, dodecylphenol, butylamine, decylamine, dodecylamine, octadecylamine, dibutylamine, methylbutylamine, methylbenzylamine, methyltetradecylamine, *N*-hydroxyethyl-*N*-butylamine, *n*-nonanol, *n*-undecanol, *n*-tridecanol, *n*-pentadecanol, *n*-hexadecanol, *n*-heptadecanol, *n*-tetracosanol, octadecenyl alcohol, 2-undecyl-5-hydroxyethyl-imidazoline, *n*-nonylamine, oleylamine, 2-ethylhexylamine, hexacosanol or lauric acid ethanolamide, or any of the above alcohols oxyalkylated with 2, 3, 4, 5, 25, 80 or 100 moles of ethylene oxide or propylene oxide or moles of a mixture of ethylene oxide and propylene oxide (in the ratio of from 0.1 to 20 moles of propylene oxide per mole of ethylene oxide), nonylphenyl-tris-oxyethyl alcohol



a mixture of two or more of those compounds, as the starting material II, and with β -sulfo-propionic anhydride, β -sulfolipalic anhydride or the anhydride of 2-ethyl-hexanoic-1-sulfonic acid-2-carboxylic acid as the starting material III.

9. A process as claimed in any of claims 4 to 8, wherein the reaction of the β -sulfo-propionic acid Ia is carried out at from 0 to 80°C using from 1 to 4 equivalents of base per mole of product Ia, the base being selected from sodium hydroxide, potassium hydroxide, morpholine, ammonia, dimethylamine, methylamine, trimethylamine, triethylamine, diethylamine, monoethylamine, propylamine, dipropylamine, tripropylamine, dibutylamine, butylamine, tributylamine, nonylamine, dinonylamine, trinonylamine, tetracosylamine, isopropylamine, diisopropylamine, triisopropylamine, stearylamine, distearylamine, tristearylamine, ehtanolamine, diethanolamine, triethanolamine, butyldiethanolamine and dimethylethanolamine.

10. A process for the manufacture of a β -sulfo-propionic acid compound carried out substantially as described in any of the foregoing Examples.

11. β -Sulfo-propionic acid compounds when manufactured by a process as claimed in any of claims 3 to 10.

12. A β -sulfo-propionic acid compound as claimed in claim 1 and individually identified in any of the foregoing Examples.

5 13. The use of a β -sulfo-propionic acid compound as claimed in claim 1, 2, 11 or 12 as a textile assistant, dishwashing detergent, hair shampoo, emulsifier, flotation agent or plasticizer. 5

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